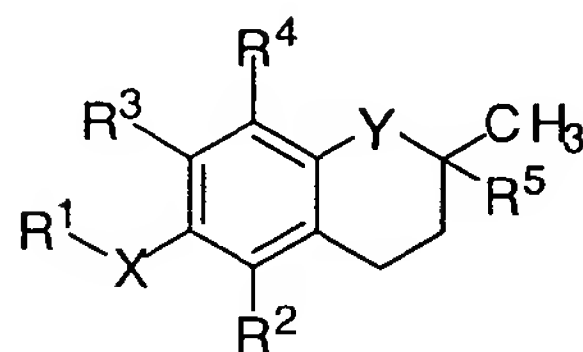


WHAT IS CLAIMED IS:

1. A method for the treatment of a cell proliferative disease comprising administering to an animal a pharmacologically effective
5 dose of a compound having a structural formula



wherein X is oxygen, nitrogen or sulfur;

Y is oxygen or NR⁶;

R¹ is R⁷, -C₁₋₄alkylene-O-C₁₋₄alkyl, -C₁₋₁₀alkylene-CO-SH, -C₁₋₄alkylene-CO-S(C₁₋₄alkyl), -C₁₋₄alkylene-CS-NH₂, saccharide, alkoxy-linked saccharide, -C₁₋₄alkylene-CO-NH_(2-n)(C₁₋₄alkyl)_n wherein n is 2 or 1, -C₁₋₄alkylene-SO₂-O(C₁₋₄alkyl), -C₁₋₄alkylene-OSO₂-O(C₁₋₄alkyl), -C₁₋₄alkylene-OP(O-C₁₋₄alkyl)₃, or -C₁₋₁₀alkylene-CN; or

X and R¹ jointly symbolize N=NR⁹;

15 R², R³ are independently hydrogen, -C₁₋₄alkyl, -CH₂(C₆H₄)C₁₋₄alkylene-COOH), -C₁₋₄alkylene-COO-CH₂(C₆H₅), -C₁₋₄alkylene-CO-NH-CH₂(C₆H₅), saccharide, -C₁₋₄alkylene-C-NH_(2-n)(C₁₋₄alkyl)_n wherein n is 2 or 1;

R⁴ is C₁₋₄alkyl, -CH₂(C₆H₄)C₁₋₄alkylene-COOH), -C₁₋₄alkylene-

COO-CH₂(C₆H₅), -C₁₋₄alkylene-CO-NH-CH₂(C₆H₅), saccharide, -C₁₋₄alkylene-CO-NH_(2-n)(C₁₋₄alkyl)_n wherein n is 2 or 1;

R⁵ is methyl or R⁸;

R⁶ is hydrogen or -C₁₋₄alkyl;

5 R⁷ is -C₁₋₁₀alkylene-COOH, -C₁₋₄alkylene-CONH₂, -C₁₋₄alkylene-COO-C₁₋₄alkyl, -C₁₋₄alkylene-CON(C₁₋₄alkylene-COOH)₂, -C₁₋₄alkylene-OH, -C₁₋₄alkylene-NH₃-halo or -C₁₋₄alkylene-OSO₂NH(C₁₋₄alkyl); and

R⁸ is -C₇₋₁₇alkyl, -COOH, -C₇₋₁₇ olefinic group containing 3 to 5 ethylenic bonds, -C=C-COO-C₁₋₄alkyl, or -C₁₋₄alkylene-COO-C₁₋₄alkyl;

10 or a pharmaceutical composition thereof;

wherein when X and Y are O,

R¹ is R⁷,

R², R³ are independently hydrogen or C₁₋₄alkyl;

R⁴ is C₁₋₄alkyl; and

15 R⁵ is R⁸;

with the proviso that R⁷ can not be -C₂₋₄alkylene-COOH nor -C₂alkylene-OH when R², R³, R⁴ are each methyl and R⁸ is a C₁₆ alkyl.

20 2. The method of claim 1, wherein said compound is selected from the group consisting of 2,5,7,8-tetramethyl-(2R-

(4R,8R,12-trimethyltridecyl)chroman-6-yloxy)acetic acid, 2,5,7,8-
 tetramethyl-2R-(4R,8R,12-trimethyltridecyl)chroman-6-yloxy) hexanoic
 acid, 2,5,7,8-tetramethyl-2R-(4R,8R,12-trimethyltridecyl)chroman-6-
 yloxy) octanoic acid, 2,5,8-trimethyl-(2R-(4R,8R,12-
 5 trimethyltridecyl)chroman-6-yloxy)acetic acid, 2,7,8-trimethyl-(2R-
 (4R,8R,12-trimethyltridecyl)chroman-6-yloxy)acetic acid, 2,8-dimethyl-
 (2R-(4R,8R,12-trimethyltridecyl) chroman-6-yloxy) acetic acid, 2,5,7,8-
 tetramethyl-2R-(4R,8R,12-trimethyltridecyl)chroman-6-yloxy)
 acetamide, methyl 2,5,7,8-tetramethyl-2R-(4R,8R,12-trimethyltridecyl)
 10 chroman-6-yloxy) acetate, 2-(N,N-(carboxymethyl)-2(2,5,7,8-
 tetramethyl-(2R-(4R,8R,12-trimethyltridecyl) chroman-6-yloxy) acetic
 acid, 2,5,7,8-tetramethyl-(2RS-(4RS,8RS,12-trimethyltridecyl)chroman-
 6-yloxy)acetic acid, 2,5,7,8-tetramethyl-(2R-(carboxy)chroman-6-
 yloxy))acetic acid, 2,5,7,8-tetramethyl-2R-(2RS,6RS,10-
 15 trimethylundecyl)chroman-6-yloxy)acetic acid, 2,5,7,8,-tetramethyl-2R-
 (2,6,10-trimethyl-1,3,5,9 E:Z decatetraen)chroman-6-yloxy)acetic acid,
 3-(2,5,7,8-tetramethyl-(2R-(4R,8,12-trimethyltridecyl)chroman-6-
 yloxy)propyl-1-ammonium chloride, 2-(2,5,7,8-tetramethyl-(2R-
 (4R,8,12-trimethyltridecyl) chroman-6-yloxy)triethylammonium
 20 sulfate, 2,5,7,8-tetramethyl-(2R-(heptyl)chroman-6-yloxy)acetic acid,
 2,5,7,8,-tetramethyl-(2R-(tridecyl)chroman-6-yloxy) acetic acid,

2,5,7,8,-tetramethyl-(2R-(heptadecyl)chroman-6-yloxy) acetic acid,
2,5,7,8,-tetramethyl-2R-(4,8,-dimethyl-1,3,7 E:Z nonotrien)chroman-6-
yloxy) acetic acid, (R)-2[(2,5,7,8-tetramethyl-2-(3 propene methyl
ester)chroman-6-yloxy]acetic acid, 2,5,7,8-tetramethyl-(2R-(methyl
5 propionate)chroman-6-yloxy)acetic acid, 1-aza- α -tocopherol-6-yloxyl-
acetic acid, 1-aza- α -tocopherol-6-yloxyl-methyl acetate, 1-aza-N-
methyl- α -tocopherol-6-yloxyl-methyl acetate, and 1-aza-N-methyl- α -
tocopherol-6-yloxyl-acetic acid.

10

3. The method of claim 1, wherein said compound
exhibits an anti-proliferative effect comprising apoptosis, DNA synthesis
arrest, cell cycle arrest, or cellular differentiation.

15

4. The method of claim 1, wherein said animal is a
human.

20

5. The method of claim 1, wherein said composition is
administered in a dose of from about 1 mg/kg to about 60 mg/kg.

6. The method of claim 1, wherein administration of said composition is selected from the group consisting of oral, topical, intraocular, intranasal, parenteral, intravenous, intramuscular, or subcutaneous.

5

7. The method of claim 1, wherein said cell proliferative disease is a neoplastic disease, a non-neoplastic disease or a non-neoplastic disorder.

10

8. The method of claim 7, wherein said neoplastic disease is selected from the group consisting of ovarian cancer, cervical cancer, endometrial cancer, bladder cancer, lung cancer, breast cancer, testicular cancer, prostate cancer, gliomas, fibrosarcomas, retinoblastomas, melanomas, soft tissue sarcomas, osteosarcomas, leukemias, colon cancer, carcinoma of the kidney, pancreatic cancer, basal cell carcinoma, and squamous cell carcinoma.

20

9. The method of claim 7, wherein said non-neoplastic disease is selected from the group consisting of psoriasis, benign proliferative skin diseases, ichthyosis, papilloma, restinosis, scleroderma, hemangioma, a viral disease, and an autoimmune disease.

5

10. The method of claim 9, wherein said autoimmune disease is selected from the group consisting of autoimmune thyroiditis, multiple sclerosis, myasthenia gravis, systemic lupus erythematosus, dermatitis herpetiformis, celiac disease, and rheumatoid arthritis.

10

11. The method of claim 7, wherein said non-neoplastic disorder is a viral disorder or an autoimmune disorder.

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12. The method of claim 11, wherein said viral disorder is Human Immunodeficiency Virus.

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13. The method of claim 11, wherein said autoimmune disorder is selected from the group consisting of the inflammatory process involved in cardiovascular plaque formation, ultraviolet radiation induced skin damage and a disorder involving an immune
5 component.

14. A method for the treatment of a cell proliferative disease comprising administering to an animal a pharmacologically
10 effective dose of 6-(2,4-dinitrophenylazo)-2,5,7,8-tetramethyltridecyl))-1,2,3,4-tetrahydroquinoline.

15. The method of claim 14, wherein said compound
15 exhibits an anti-proliferative effect comprising apoptosis, DNA synthesis arrest, cell cycle arrest, or cellular differentiation.

16. The method of claim 14, wherein said animal is a
20 human.

17. The method of claim 14, wherein said composition is administered in a dose of from about 1 mg/kg to about 60 mg/kg.

5 18. The method of claim 14, wherein administration of said composition is selected from the group consisting of oral, topical, intraocular, intranasal, parenteral, intravenous, intramuscular, or subcutaneous.

10 19. The method of claim 14, wherein said cell proliferative disease is a neoplastic disease, a non-neoplastic disease or a non-neoplastic disorder.

15 20. The method of claim 19, wherein said neoplastic disease is selected from the group consisting of ovarian cancer, cervical cancer, endometrial cancer, bladder cancer, lung cancer, breast cancer, testicular cancer, prostate cancer, gliomas, fibrosarcomas, 20 retinoblastomas, melanomas, soft tissue sarcomas, osteosarcomas, leukemias, colon cancer, carcinoma of the kidney, pancreatic cancer,

basal cell carcinoma, and squamous cell carcinoma.

21. The method of claim 19, wherein said non-neoplastic
5 disease is selected from the group consisting of psoriasis, benign
proliferative skin diseases, ichthyosis, papilloma, restinosis,
scleroderma, hemangioma, a viral disease, and an autoimmune disease.

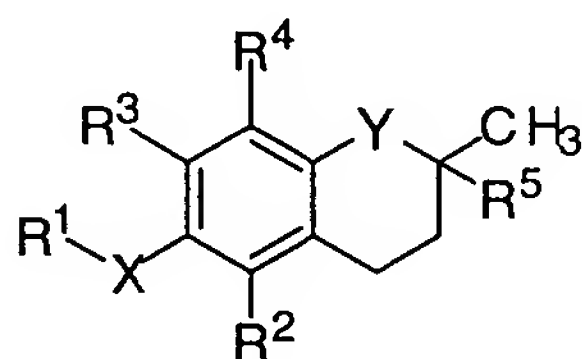
10 22. The method of claim 21, wherein said autoimmune
disease is selected from the group consisting of autoimmune thyroiditis,
multiple sclerosis, myasthenia gravis, systemic lupus erythematosus,
dermatitis herpetiformis, celiac disease, and rheumatoid arthritis.

15 23. The method of claim 19, wherein said non-neoplastic
disorder is a viral disorder or an autoimmune disorder.

20 24. The method of claim 23, wherein said viral disorder is
Human Immunodeficiency Virus.

25. The method of claim 23, wherein said autoimmune disorder is selected from the group consisting of the inflammatory process involved in cardiovascular plaque formation, ultraviolet radiation induced skin damage and disorders involving an immune
5 component.

26. A method of inducing apoptosis of a cell, comprising the step of contacting said cell with a pharmacologically effective dose
10 of a compound having a structural formula



wherein X is oxygen, nitrogen or sulfur;

Y is oxygen or NR⁶;

15 R¹ is R⁷, -C₁₋₄alkylene-O-C₁₋₄alkyl, -C₁₋₁₀alkylene-CO-SH, -C₁₋₄alkylene-CO-S(C₁₋₄alkyl), -C₁₋₄alkylene-CS-NH₂, saccharide, alkoxy-linked saccharide, -C₁₋₄alkylene-CO-NH_(2-n)(C₁₋₄alkyl)_n wherein n is 2 or 1, -C₁₋₄alkylene-SO₂-O(C₁₋₄alkyl), -C₁₋₄alkylene-OSO₂-O(C₁₋₄alkyl), -C₁₋₄alkylene-OP(O-C₁₋₄alkyl)₃, or -C₁₋₁₀alkylene-CN; or

X and R¹ jointly symbolize N=NR⁹;

R², R³ are independently hydrogen, -C₁₋₄alkyl, -CH₂(C₆H₄)C₁₋₄alkylene-COOH), -C₁₋₄alkylene-COO-CH₂(C₆H₅), -C₁₋₄alkylene-CO-NH-CH₂(C₆H₅), saccharide, -C₁₋₄alkylene-C-NH_(2-n)(C₁₋₄alkyl)_n wherein n is 2 or 1;

R⁴ is C₁₋₄alkyl, -CH₂(C₆H₄)C₁₋₄alkylene-COOH), -C₁₋₄alkylene-COO-CH₂(C₆H₅), -C₁₋₄alkylene-CO-NH-CH₂(C₆H₅), saccharide, -C₁₋₄alkylene-CO-NH_(2-n)(C₁₋₄alkyl)_n wherein n is 2 or 1;

R⁵ is methyl or R⁸;

R⁶ is hydrogen or -C₁₋₄alkyl;

R⁷ is -C₁₋₁₀alkylene-COOH, -C₁₋₄alkylene-CONH₂, -C₁₋₄alkylene-COO-C₁₋₄alkyl, -C₁₋₄alkylene-CON(C₁₋₄alkylene-COOH)₂, -C₁₋₄alkylene-OH, -C₁₋₄alkylene-NH₃-halo or -C₁₋₄alkylene-OSO₂NH(C₁₋₄alkyl); and

R⁸ is -C₇₋₁₇alkyl, -COOH, -C₇₋₁₇olefinic group containing 3 to 5 ethylenic bonds, -C=C-COO-C₁₋₄alkyl, or -C₁₋₄alkylene-COO-C₁₋₄alkyl; or a pharmaceutical composition thereof;

wherein when X and Y are O,

R¹ is R⁷,

R², R³ are independently hydrogen or C₁₋₄alkyl;

R⁴ is C₁₋₄alkyl; and

R⁵ is R⁸;

with the proviso that R^7 can not be $-C_{2-4}alkylene-COOH$ nor $-C_2alkylene-OH$ when R^2, R^3, R^4 are each methyl and R^8 is a C_{16} alkyl.

5 27. The method of claim 26, wherein said compound is selected from the group consisting of 2,5,7,8-tetramethyl-(2R-(4R,8R,12-trimethyltridecyl)chroman-6-yloxy)acetic acid, 2,5,7,8-tetramethyl-2R-(4R,8R,12-trimethyltridecyl)chroman-6-yloxy) hexanoic acid, 2,5,7,8-tetramethyl-2R-(4R,8R,12-trimethyltridecyl)chroman-6-yloxy) octanoic acid, 2,5,8-trimethyl-(2R-(4R,8R,12-trimethyltridecyl)chroman-6-yloxy)acetic acid, 2,7,8-trimethyl-(2R-(4R,8R,12-trimethyltridecyl)chroman-6-yloxy)acetic acid, 2,8-dimethyl-(2R-(4R,8R,12-trimethyltridecyl) chroman-6-yloxy) acetic acid, 2,5,7,8-tetramethyl-2R-(4R,8R,12-trimethyltridecyl)chroman-6-yloxy) acetamide, methyl 2,5,7,8-tetramethyl-2R-(4R,8R,12-trimethyltridecyl)chroman-6-yloxy) acetate, 2-(N,N-(carboxymethyl)-2(2,5,7,8-tetramethyl-(2R-(4R,8R,12-trimethyltridecyl) chroman-6-yloxy) acetic acid, 2,5,7,8-tetramethyl-(2RS-(4RS,8RS,12-trimethyltridecyl)chroman-6-yloxy)acetic acid, 2,5,7,8-tetramethyl-(2R-(carboxy)chroman-6-yloxy))acetic acid, 2,5,7,8-tetramethyl-2R-(2RS,6RS,10-trimethylundecyl)chroman-6-yloxy)acetic acid, 2,5,7,8,-tetramethyl-2R-

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(2,6,10-trimethyl-1,3,5,9 E:Z decatetraen)chroman-6-yloxy)acetic acid,
 3-(2,5,7,8-tetramethyl-(2R-(4R,8,12-trimethyltridecyl)chroman-6-yloxy)propyl-1-ammonium chloride, 2-(2,5,7,8-tetramethyl-(2R-(4R,8,12-trimethyltridecyl)chroman-6-yloxy)triethylammonium
 5 sulfate, 2,5,7,8-tetramethyl-(2R-(heptyl)chroman-6-yloxy)acetic acid,
 2,5,7,8,-tetramethyl-(2R-(tridecyl)chroman-6-yloxy) acetic acid,
 2,5,7,8,-tetramethyl-(2R-(heptadecyl)chroman-6-yloxy) acetic acid,
 2,5,7,8,-tetramethyl-2R-(4,8,-dimethyl-1,3,7 E:Z nonotrien)chroman-6-yloxy) acetic acid, (R)-2[(2,5,7,8-tetramethyl-2-(3 propene methyl
 10 ester)chroman-6-yloxy]acetic acid, 2,5,7,8-tetramethyl-(2R-(methyl propionate)chroman-6-yloxy)acetic acid, 1-aza- α -tocopherol-6-yloxyl-acetic acid, 1-aza- α -tocopherol-6-yloxyl-methyl acetate, 1-aza-N-methyl- α -tocopherol-6-yloxyl-methyl acetate, and 1-aza-N-methyl- α -tocopherol-6-yloxyl-acetic acid.

15

28. The method of claim 26, wherein said method is useful in the treatment of a cell proliferative disease.

20

29. A method of inducing apoptosis of a cell, comprising the step of contacting said cell with a pharmacologically effective dose of 6-(2,4-dinitrophenylazo)-2,5,7,8-tetramethyltridecyl)-1,2,3,4-tetrahydroquinoline.

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30. The method of claim 29, wherein said method is useful in the treatment of a cell proliferative disease.

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